REMARKS

Entry of this Preliminary Amendment before continued examination of the instant application is respectfully requested. Upon entry of this Amendment, claims 1, 5-24 and 28-40 remain in the application. Claims 2-4 and 25-27 have been cancelled without prejudice. Reconsideration of the claims is respectfully requested.

Claims 1-40 stood rejected (in the Final Office Action of May 26, 2006) under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement. The Examiner states that there is no support in the specification as filed for controllably forming or growing nanowires in the third dimension.

Applicants respectfully disagree with the Examiner. It is submitted that controllable growth in the third-dimension is taught throughout the specification as filed, at least at paragraphs 0013, 0020, 0027, 0028, 0039 and 0041, and in Figures 1C, 2, and 3A through 3C. In particular, the controlled nanowire growth includes positioning the particles on the major surface of the substrate (as described in paragraphs 0022-0025), substantially ensuring sufficient intimate contact between the catalyst and the substrate (as shown in Fig. 2, where the nanoparticle is partially embedded in the substrate with no intermediate oxide layer therebetween), forming particles of a uniform size (as shown in Fig. 1C), and exposing the particles to two or more gases (as described in paragraph 0029).

Further regarding the written description requirement, the courts have held that the subject matter of the later claim need not be described literally or "*in ipsis verbis*" in order for the specification to satisfy the description requirement. See, e.g., *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352 (Fed. Cir.), reh'g denied, 2003 U.S. App. LEXIS 22508 (2003); and *In re Lukach*, 442 F.2d 967, 969, 169 U.S.P.Q. 795, 796 (C.C.P.A. 1971).

Thus, it is submitted that the support for the recitation of controllably forming or growing nanowires in the third dimension may, indeed, be gleaned from the specification and drawings as originally filed and as understood in their totality.

As such, it is submitted that the rejection under 35 U.S.C. 112, first paragraph is erroneously based, and withdrawal of the same is respectfully requested.

Claims 1-7, 10-18 and 20-40 stood rejected (in the Final Office Action of May 26, 2006) under 35 U.S.C. 103(a) as being unpatentable over Li et al (U.S. Patent No. 6,831,017) in view of Gudiksen et al (referred to herein as "Nature Paper"). The Examiner states that Li teaches vertical nanowires, but fails to teach that the nanowires are made of two different materials. The Examiner goes on to state that the Nature Paper teaches growing nanowires having two different materials.

Claims 8, 9 and 19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Li in view of the Nature Paper. The Examiner admits that neither of the references teach a mold for applying the catalyst material. The Examiner concludes however, that in the absence of unexpected results, it would have been obvious to one of ordinary skill in the art through routine experimentation to find the optimum, operable means to pattern and apply the catalyst of Li.

The Examiner's attention is drawn to the Declaration pursuant to 37 C.F.R. 1.132 filed herewith. The 132 Declaration illustrates why one skilled in the art would not have been led to combine the teachings of Li with the teachings of the Nature Paper as suggested by the Examiner. Li specifically states that vertical growth may be controlled by exposing the nanowires to an electric field (external or from plasma). One skilled in the art would conclude from this teaching that the nanowire diameter of Li must be thin enough to be manipulated by the applied electric field taught by Li (about 700 V/cm). It is submitted that the nanowires of the Nature Paper have a thickness that would require an external electric field for alignment much larger than the 700 V/cm taught by Li (for example, as stated in the 132 Declaration filed herewith, a field of about $E > 10^6$ V/cm would be required to align a nanowire having a diameter of 20 nm). Further, in addition to this very large field, it is submitted that undue experimentation and extensive procedures of the process (which procedures are not taught in either of Li or the Nature Paper) would be required to successfully align the nanowires in this manner. In addition to these procedures not being taught or suggested (or even within the skill set of the ordinarily skilled artisan), such procedures would be so complicated as to render the Examiner's suggested combined process impractical for use (see 132 Declaration submitted herewith for further discussion).

Furthermore, it is submitted that if one skilled in the art were to attempt to use the plasma taught in Li to align the segmented nanowires taught in the Nature Paper, one would likely damage at least one segment of the Nature paper nanowires for reasons discussed in the 132 Declaration. Further, it is submitted that the net or DC field provided by the plasma is too low to achieve a sufficiently high aligning electric field.

Applicants specifically state, in the specification as filed, that the nanowires would be large enough to be reasonably rigid and maintain the spacing within the array (paragraph 0042). An example of such a nanowire diameter is 40 nm (paragraph 0047). This is of a qualitatively similar magnitude as the nanowire diameters taught in the Nature Paper.

Still further, the Applicants respectfully submit that the Nature Paper does not teach, nor suggest any reason for removal of the **native oxide** from the substrate upon which the nanowires are grown. It is submitted that vertical nanowires cannot be grown from such a substrate having the native oxide thereon. As the Nature Paper teaches removal of the nanowires from the substrate after growth, the alignment of the nanowires during growth is not important. The random direction that one can achieve on an amorphous surface, such as a native oxide, is adequate if one is planning to remove nanowires from the substrate after growth. Therefore, one would not be led by the Nature Paper to remove the native oxide layer to form vertical nanowires.

Regarding specifically claims 7 and 30, Applicants recite materials that form crystalline nanowires in a matrix of a crystalline material. In sharp contrast, Li teaches amorphous matrix materials. The Nature Paper teaches crystalline nanowires, but no matrix. Applicants respectfully submit that the three-dimensional nanocrystal array of Applicants' invention as defined in claims 7 and 30 cannot be achieved in an amorphous matrix. In order to obtain isolated nanocrystals embedded in a uniform matrix, the matrix is the same material and has the same crystal structure as the segments surrounding the segment that becomes the isolated nanocrystal. Therefore, an amorphous matrix (as taught by Li) does not satisfy the components for this structure, and thus would not render obvious Applicants' invention as recited in claims 7 and 30.

Furthermore, regarding claims 8, 9 and 19, Applicants respectfully submit that neither Li nor the Nature paper teach or suggest a mold for applying the catalyst material. Applicants' mold as recited in these claims allows precision positioning of the catalyst particles with respect to each other. The mold allows controllability of 3-D nanowires to within several nm in the plane defined by the substrate (see paragraph 0023 in the specification as filed, "protruding features 12 of the mold 10 will have a lateral dimension within the range of about 5 to 20 nm."). In addition, neither Li nor the Nature paper teach or suggest partially embedding the catalyst nanoparticle in the substrate surface, as shown in the Applicants' Figure 2, with no intermediate native oxide layer. This embedding with no intermediate native oxide layer substantially ensures the intimate, atomic contact for directional, epitaxial, aligned growth.

For all the reasons stated above, it is submitted that Applicants' invention as defined in claims 1, 5-24 and 28-40 is not anticipated, taught or rendered obvious by the cited references, either alone or in combination, and patentably defines over the art of record.

In summary, claims 1, 5-24 and 28-40 remain in the application. It is submitted that, through this amendment, Applicants' invention as set forth in these claims is in a condition suitable for allowance.

Further and favorable consideration is requested. If the Examiner believes it would expedite prosecution of the above-identified application, he is cordially invited to contact Applicants' Attorney at the below-listed telephone number.

Respectfully submitted,

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